Do-It-Yourself Stormwater Management

This section gives you everything you need to start better managing stormwater on your property. There are several different approaches you can use to get started.

1. Dig Right In!

You can simply choose any of the stormwater treatment practices and use the DIY fact sheets contained in this section to install them. While you might not select the absolute best-suited stormwater treatment practice or location on your property, every positive action helps and any stormwater treatment is better than none.

2. Create a Project Plan

If you want to get a bit more technical, this section outlines steps to document the existing and planned conditions of your property (if you are proposing to build a garage or patio or other improvement to your property) and select the best suited type and location of stormwater treatment practice for your property.

3. Estimate Your Stormwater Footprint

If you want to understand the impact of your property on the water quality of your watershed as well as the benefit of installing stormwater treatment practices, you can use all of the information gathered in your project plan, and use the NH Residential Loading Model available at www.des.nh.gov/organization/divisions/water/stormwater to estimate your "stormwater footprint". Your stormwater footprint is the amount of phosphorus, nitrogen, and sediment that run off of your property. You can also use the model to see what type of stormwater treatment will be most effective at reducing your stormwater footprint.

Create A Project Plan

Any change that you make on your property to reduce impervious surfaces, prevent erosion, and infiltrate stormwater makes a positive difference in your **watershed** and reduces your stormwater footprint.

To best manage stormwater on your property it helps to create a plan to map out your property and estimate how much stormwater your property creates, where the stormwater is coming from, and how it travels across your property. Once you identify these details, you can decide how to best manage your stormwater and you can use the NH Residential Loading Model to estimate your stormwater footprint.

1. MAP YOUR PROPERTY

The first step to creating a project plan is to map your property. There are several resources that you can use to do this. The **Site Sketch Grid** in Appendix C can be used to create a drawing of your property. The squares on the grid can be used as a scale to help you draw the house, driveway, and other property features in proportion to one another. Other resources available to map your property include:

- Google Maps - satellite or Google Earth imagery
- Municipal offices/web site - tax map, online GIS (if available)
- Approved septic system plan, if you have a septic system

If you are proposing changes from the existing condition, for example if you are putting on an addition or installing stormwater treatment practices, you may want to make separate maps.

When using the Site Sketch Grid, do your best to scale your drawings so your house, driveway, and other property features are in proportion to one another.

1/2 acre lot: 1 sq = 25 ft²
1 acre lot: 1 sq = 50 ft²
2 acre lot: 1 sq = 100 ft²

HELPFUL TOOLS

Gather the following materials to help create your project plan.

- Measuring tape
- Ruler
- Calculator
- Shovel
- Bucket or waterproof container
- Paper and Pen
- Site Sketch Grid from Appendix C
- Tax map or aerial photo of your property with lot lines (this is available on many town websites)

EXISTING CONDITION

Map or sketch your property the way it currently exists including the features identified in Property Details in Step 2.

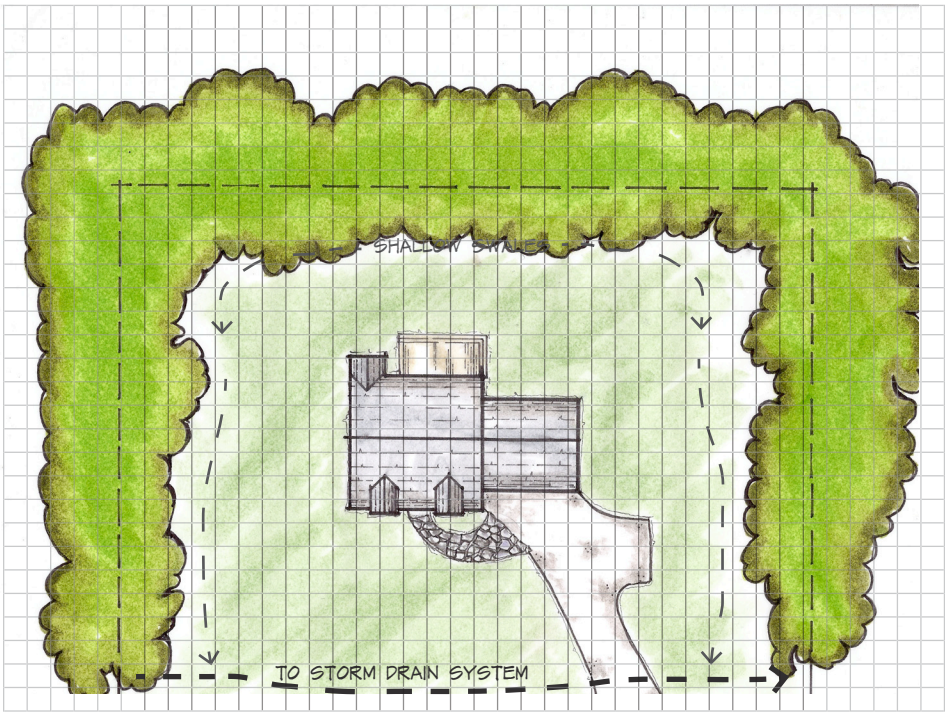

Figure 1. Example existing conditions map

PLANNED CONDITION

Make a sketch of your property to show proposed changes and improvements such as building an addition, deck or storage shed, clearing trees to expand your lawn, or installing stormwater treatment practices.

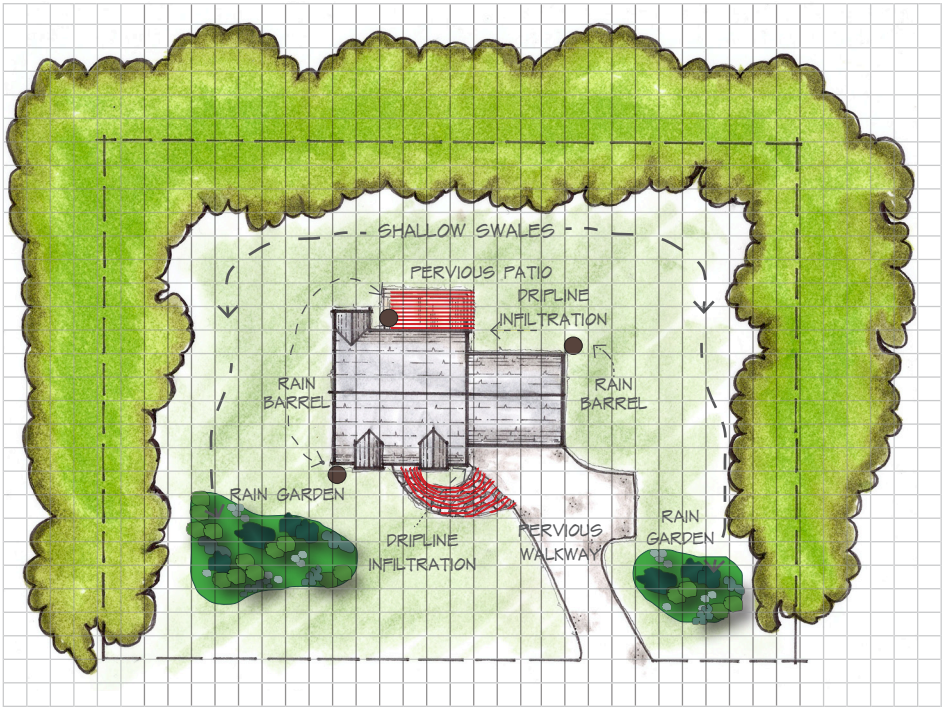

Figure 2. Example planned conditions map.

2. IDENTIFY PROPERTY DETAILS

Complete the **Project Planning Worksheet** in Appendix D by identify the following features of your property including:

Lot Size

You can look up the size of your lot on your property tax assessment, the deed to your house, the purchase and sales agreement for your home, on your town's web site, or you can contact your town offices.

Note: If you are proposing changes or improvements to your property such as building an addition, deck, or storage shed, clearing trees to expand your lawn, or installing stormwater treatment practices, you will want to identify these features for both the existing and planned conditions.

Break Down of Land Cover Types

Knowing the general size of each type of land cover on your property can help you create a property plan to manage stormwater. For example, impervious areas can be reduced, disconnected, or eliminated. Lawns areas can be made smaller and buffers can be created. You can estimate the area of each land use type by doing the following.

Impervious Roof

Measure the length and width of your house, garage, and any other structure that has a roof with a tape measure (Figure 3).

~ ROOF AREA (ft²) = LENGTH x WIDTH

ROOF AREA 1 = 32' x 38' = 1216 ft²

ROOF AREA 2 = 24' x 26' = 624 ft²

Add the roof areas together to get the total impervious roof area for the property.

ROOF AREA$_1$ + ROOF AREA$_2$ + ... = TOTAL IMPERVIOUS ROOF (ft²)

1216 ft² + 624 ft² = 1840 ft²

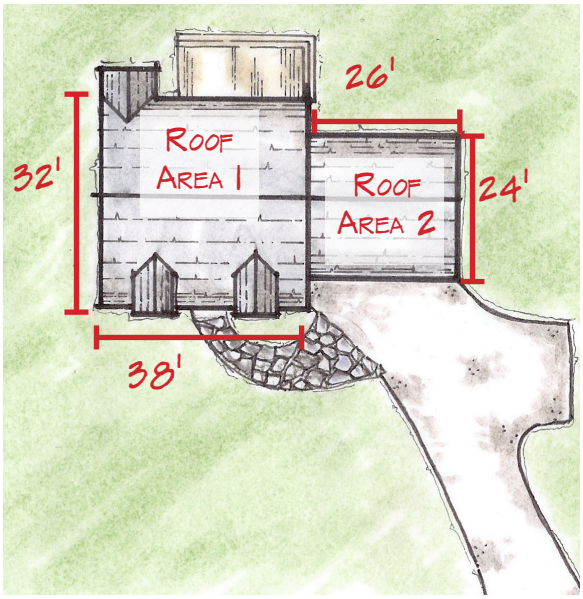

Figure 3. Measuring impervious roof areas.

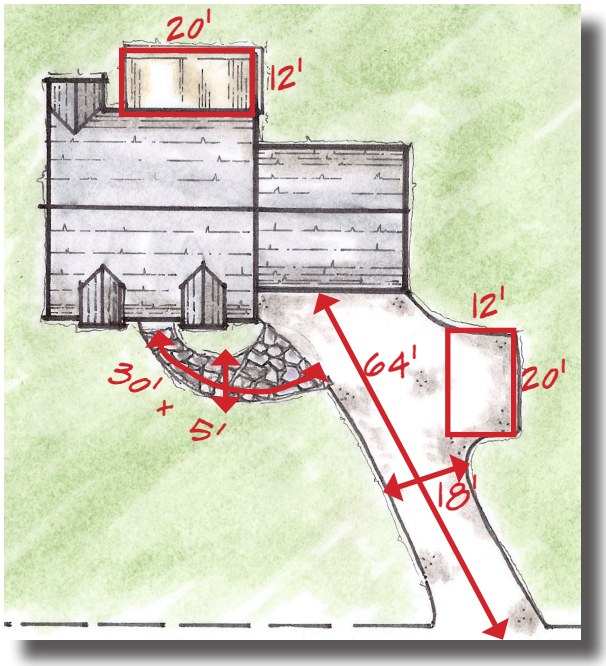

Figure 4. Measuring other hard surface areas.

Other Hard Surfaces

Other hard surfaces include any driveways, walkways, decks, patios, or other surfaces that prevent water from soaking into the ground. Measure the average length and average width of these areas with a tape measure (Figure 4). Add the areas together to get the total other hard surfaces area for the property.

~ OTHER HARD SURFACE AREA (ft²) = LENGTH x WIDTH

DRIVEWAY 1 = 64' x 18' = 1152 ft²
DRIVEWAY 2 = 20' x 12' = 240 ft²
WALKWAY = 30' x 5' = 150 ft²
PATIO = 20' x 12' = 240 ft²

TOTAL OTHER HARD SURFACES AREA (ft²):

1152 ft² + 240 ft² + 150 ft² + 240 ft² = 1782 ft²

Lawn and Landscaped Areas

Lawn and landscaped areas include any areas with grass or gardens that you regularly maintain. Measure the average length and average width of each of these areas with a tape measure (Figure 5). Add the areas together to get the total lawn/landscape area. If your property has no natural or forested areas on it, you can simply subtract the impervious roof and other hard surface areas from your total lot size to get the lawn/landscaped area.

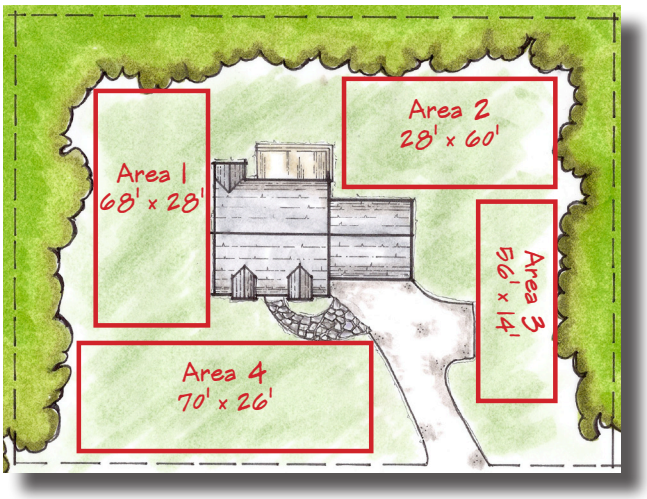

Figure 5. Measuring lawn areas.

~ LAWN/LANDSCAPE AREA (ft²) = LENGTH x WIDTH

AREA 1 = 68' x 28' = 1904 ft²
AREA 2 = 28' x 60' = 1680 ft²
AREA 3 = 56' x 14' = 784 ft²
AREA 4 = 70' x 26' = 1820 ft²

TOTAL LAWN/LANDSCAPE AREAS (ft²):

1904 ft² + 1680 ft² + 784 ft² + 1820 ft² = 6188 ft²

Forested or Natural Areas

Forested and natural areas include any areas that are naturally vegetated and are not actively maintained. You can estimate the size of these areas by measuring the average length and average width of each area and adding them together. Or, you can subtract the impervious roof, other hard surfaces, and lawn/landscaped areas from the total lot size to get the forested/natural area of your property.

~ TOTAL FORESTED/NATURAL AREA = TOTAL LOT SIZE - (IMPERVIOUS ROOF + OTHER HARD SURFACES + LAWN/ LANDSCAPED AREAS)

EXAMPLE: 43,560 ft^2 - (1840 ft^2 + 1782 ft^2 + 6188 ft^2) = 33,750 ft^2

Roof Downspouts

If you have gutters on your house, follow them along the roof line to where they travel down the side of the house and discharge out the downspout. There may be more than one downspout on your house. Identify their locations or other areas where rain collects and runs off of your roof such as a valley where two roofs join together. This will help you plan the best placement for stormwater treatment practices to capture roof runoff.

Vegetated Buffer Areas

Identify **vegetated buffer** areas such as trees or other vegetated areas at the edge of your property boundary or around features on your property such as streams, wetlands, or steep slopes.

Vegetated Buffer - areas of natural or established vegetation allowed to grow with minimal to no maintenance.

Buffers reduce the velocity of runoff, promote groundwater recharge, filter out sediments and provide shade to reduce the thermal impacts of runoff to receiving waters. Buffers also provide habitat for wildlife.

Steep Slopes & Other Vulnerable Areas

Identify any areas on your property with steep slopes. Take note if there are any areas on the slope that regularly erode. Existing rills or gullies in the soil or exposed roots and rocks identify areas that may have erosion problems. Planting or allowing natural vegetation to grow along the top of the slope to create a buffer can protect against slope erosion.

Stormwater Treatment Practices

Identify any existing or planned stormwater treatment practices and their approximate location on your property.

Streams or Ponds

Identify any streams or ponds on your property or near your property that your property drains to. You can go one step farther and look up the watershed that your property resides in and the waterbodies that your property has the potential to impact. You can also look up the water quality of those waterbodies to see if they are high quality or if they have any impairments to consider in the New Hampshire Surface Water Quality Assessment at www.des.nh.gov/organization/divisions/water/wmb/swqa/index.

3. IDENTIFY HOW AND WHERE STORMWATER FLOWS

When rain hits the ground, it often flows over the ground surface, down hills or through channels before it exits your property, soaks into the ground, or finds a low spot to puddle. Using the property maps that you created, you can estimate how and where stormwater flows on your property by following the steps below.

1. Pretend you're a raindrop (use a ball to mimic a raindrop, or better yet, watch a real storm event). Identify high points in your lawn or driveway. Observe the directions that water flows and the places where the water ends up (the stormwater endpoints). These could be places where water puddles, where it enters a catch basin, or where it enters or will enter a stormwater treatment practice.

2. Draw a boundary line on your project map around the area that drains to each stormwater endpoint. The boundary line represents the "drainage area" for each stormwater endpoint. Within that boundary line, all of the water that falls on the property drains to a common endpoint. For example, Figure 6 below shows that all of the stormwater from the back of this garage drains to a rain barrel. So a line was drawn around the perimeter of the back half of the garage roof. This rain barrel drainage area is labeled with a "1".

   Also, most of the yard to the right of the house flows into a swale and then drains into a rain garden at the bottom right of the property. So a line was drawn around the perimeter of the yard area that drains to the rain garden. This rain garden drainage area is labeled with a "7" in Figure 6.

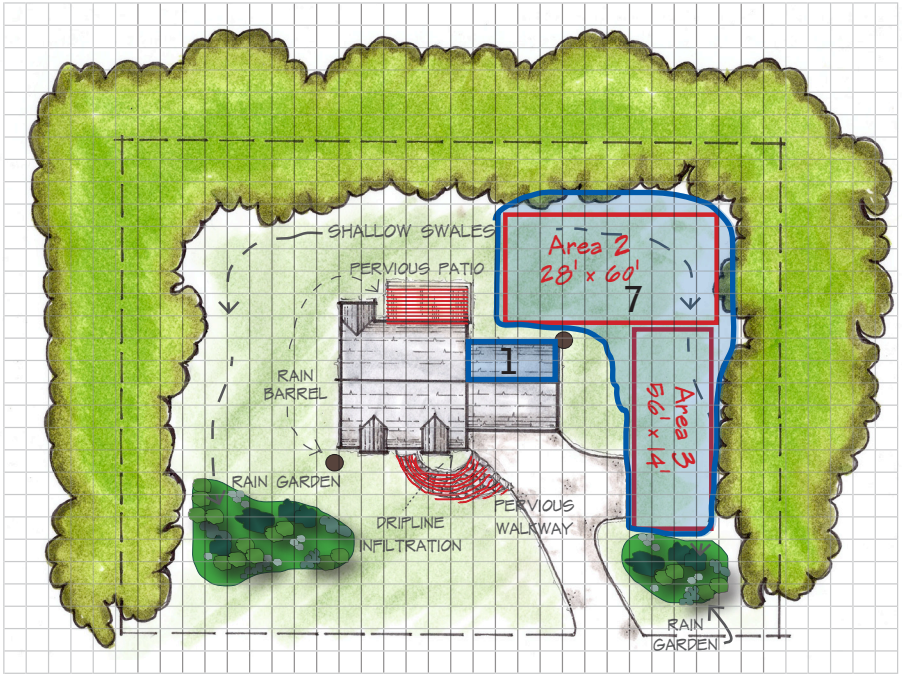

Figure 6. Draw the boundary lines (drainage areas) for stormwater endpoints.

3. To estimate the size of the drainage area to each stormwater endpoint, you can use the measurements that you recorded on your Project Planning Worksheet to estimate the average area within each boundary line, or if you used the **Site Sketch Grid** in Appendix C, you can count the squares within each boundary line. The example property in figure 7 is a 1-acre lot. This makes each grid box approximately 50 ft^2. The estimated drainage areas to each stormwater treatment practice are summarized in Table 1 below.

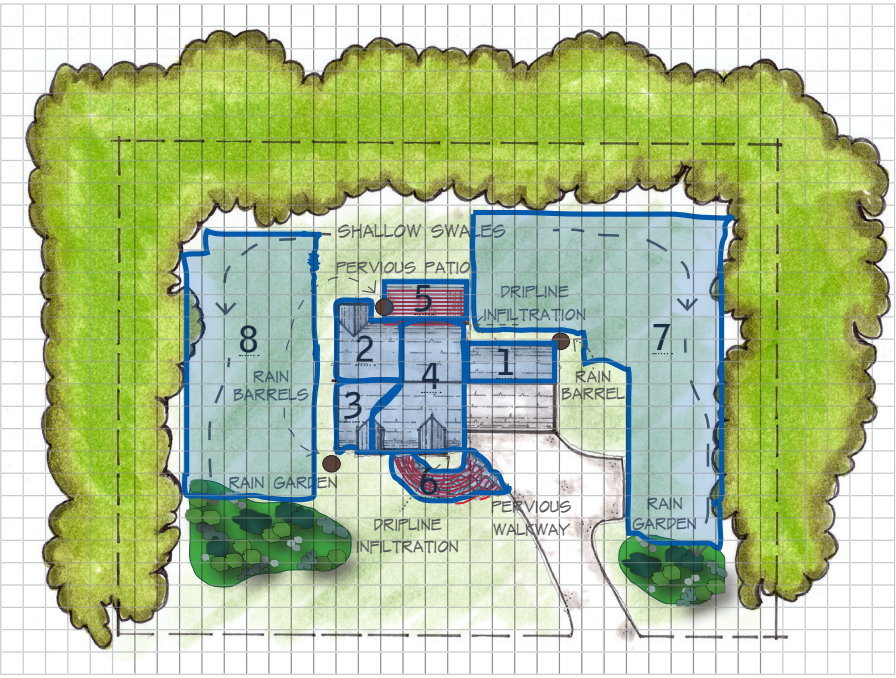

Figure 7. Estimate the drainage area within each boundary line.

Table 1. Summary of example drainage areas to each stormwater treatment practice.

Drainage Area	Stormwater Treatment Practice	Land Use Type	Approx. area (ft^2)
1	rain barrel	impervious roof	312
2	rain barrel	impervious roof	304
3	rain barrel	impervious roof	203
4	dripline infiltration trench	impervious roof	709
5	pervious pavers	other hard surface	240
6	pervious pavers	other hard surface	150
7	rain garden	lawn/landscape	2464
8	rain garden	lawn/landscape	2814

4. You can group drainage areas with the same stormwater treatment practices and the same land use type together if desired (Figure 8). This is recommended if you are going to estimate your stormwater footprint using the NH Residential Loading Model.

Table 2. Drainage areas grouped by land use type and stormwater treatment practice.

Drainage Area	Stormwater Treatment Practice	Land Use Type	Approx. area (ft^2)
1	rain barrel	impervious roof	312
2	rain barrel	impervious roof	304
3	rain barrel	impervious roof	203
4	dripline infiltration trench	impervious roof	709
5	pervious pavers	other hard surface	240
6	pervious pavers	other hard surface	150
7	rain garden	lawn/landscape	2464
8	rain garden	lawn/landscape	2814

4. ESTIMATE HOW MUCH STORMWATER YOUR PROPERTY CREATES

The roof and other hard surfaces (e.g., impervious areas) on your property, such as driveways, walkways, decks, and patios, create the most stormwater. While lawns and landscaped areas contribute to the stormwater problem, managing the stormwater that comes from the impervious surfaces on your property is the best way to reduce the amount of stormwater created and reduce your overall stormwater footprint.

Note: In NH, capturing and treating the first 1-inch of runoff from a rain event is roughly equivalent to capturing the "water quality volume" or 90 percent of the annual stormwater runoff volume. By capturing and treating the water quality volume, you remove the majority of stormwater pollutants.

Identify the impervious areas that create the most stormwater runoff helps to select the best locations to install stormwater treatment practices to address the problem areas.

To estimate the amount of stormwater your property creates, complete the following steps:

1. Add up all the areas of impervious roof and other hard surfaces (in ft^2) that you identified in your Property Details.

$IMPERVIOUS\ AREA_1 + IMPERVIOUS\ AREA_2 + \ldots = IMPERVIOUS\ AREA_{total}$

2. To determine the volume of stormwater created during a storm that produces 1-inch of rain, multiply the total area of impervious (from above) by 1-inch. Keep in mind that some storms produce greater than an inch of runoff. Stormwater treatment practices could be oversized to accommodate overflow or the practice could be designed to direct overflow to another treatment practice or a designated pervious area.

$(IMPERVIOUS\ AREA_{total}\ ft^2) \times (1\ inch / 12) = STORMWATER\ VOLUME\ (ft^3)$

Example: During a rain storm that produces 1-inch of rain, a typical 2400 ft^2* house with a two car garage would create...

$(3{,}730\ ft^2) \times (1\ inch/12) = 311\ ft^3$

That is equal to 2,326 gallons or about 55 bath tubs filled to the brim!

* House is assumed to be 2-story with ~1200 ft^2 of roof area, 800 ft^2 of garage roof, and 1730 ft^2 of other hard surfaces including driveway, walkways and patios.

5. IDENTIFY STORMWATER TREATMENT PRACTICES

Use the table below to help select one or more stormwater treatment practices that are right for your property. Refer to the **DIY Fact Sheets** section on page 25 for a description of each treatment practice.

Table 3. Summary of requirements and limitations of stormwater treatment practices.

	Infiltration Trenches	Dry Well	Rain Garden	Pervious Walkway	Vegetated Swale	Infiltration Steps	Rain Barrel	Water Bar
Space Required min surface area: min width: min length: min depth:	 8 to 32 ft² 1 to 4 ft 4 to 8 ft 8 inches	 8 to 32 ft² 2 to 4 ft 4 to 8 ft 3 ft	 50 to 200 ft² 5 to 10 ft 10 to 20 ft 3 to 8 inches	as needed to accommo-date walkway or patio area	bottom width: 2 ft. minimum 6 ft maximum	as needed to accomodate slope	not a factor - near downspouts	as needed
% Nutrient Removal Total Phosphorus: Total Nitrogen:	 60 55	 60 55	 34 65	 65 60	 20 20	 60 55	 0 0	 0 0
% Runoff Volume Reduction	90	90	80	75	60	90	40	0
Slopes	usually not a limitation, but a design consideration. Should locate down-slope of buildings and foundations			5% or less	swale side slopes: 3:1 or flatter longitudinal slope: 1.0% min	usually not a limitation, but a design consideration		
Water Table/ Bedrock	1 to 4 ft clearance				usually not a factor			
Proximity to foundations	minimum distance of 10 ft down-slope from buildings and foundations - unless dripline infiltration trench						not a factor	
Maintenance All LID practices should be inspected seasonally and after major storm events.	moderate - Inspect for signs of erosion or clogging. Remove any vegetation growing in the trench.	low - Inspect for signs of clogging such as ponding. Remove any vegetation growing over the dry well.	low - Inspect for signs of erosion where water enters the garden. Remove accumulated sediment. Replace mulch and vegetation as needed.	moderate to high - Inspect for signs of clogging such as ponding. Pressure wash and replace pea stone as needed to maintain infiltration.	low - Inspect for erosion. Remove accumulated sediment and replace vegetation as needed.	moderate - Inspect for signs of erosion or clogging. Remove any vegetation growing in the steps.	low - Empty barrel after each rain event or, at a minimum, when barrel is full.	

Adapted from Low-Impact Development: An Integrated Design Approach. Price George's County, Maryland. June 1999 and the NH Stormwater Manual. December 2008.

6. SELECT AND VERIFY THE LOCATION OF YOUR STORMWATER TREATMENT PRACTICES

Using the map of your property that you created, select the best locations to install your stormwater treatment practices. Keep the following tips in mind:

- ✓ A stormwater treatment practice should be placed along the natural path where stormwater flows.
- ✓ Place LID practices at least 10 feet away from the building to prevent seepage into the basement.
- ✓ Do not place over a septic tank or leach field.
- ✓ Do not place near a drinking water well.
- ✓ Avoid disturbing tree roots as the tree may be injured by digging and may not tolerate additional soil moisture.
- ✓ Make sure LID practices meet all property setbacks. You can verify setbacks with your town.

Call Before You Dig:
Before you start any excavation project, it is your responsibility to locate any underground utilities on your property. Check for private wiring or underground utilities such as driveway lights and sheds with electricity. Call Dig Safe® at 1-888-dig-safe at least three days before digging to avoid underground pipes and utilities.

Before installing your stormwater treatment practice it is important to make sure that the water table and soils in the area you choose will allow the practice to function properly.

Water Table

The water table is the level underground where water has fully saturated the soil and is the source of groundwater. If there are any low points on your property that tend to be wet or have very moist soil even when it has not rained, this typically means there is a high water table or slowly draining soils. It is important that the bottom of your stormwater treatment practice is above the seasonal high water table. This will make sure that it functions correctly and there is enough soil to treat the stormwater before coming into contact with the groundwater.

Basic Soil Types

In simple terms, soils can be classified as sandy, loam, or clay. Knowing the type of soil on your property can help you choose what stormwater practice to use. Sandy soils have the fastest infiltration and clay soils have the slowest. Since clay soils take longer to drain, they may require you to construct a larger stormwater treatment practice than if there were sandy soils.

You can do the following tests to help determine if the location you have selected to install your stormwater treatment practice is a good location.

Quick Tests

Simple Perc Test

To conduct a simple perc test, use the following steps.

a. Using a shovel or a post hole digger, dig a 1-foot deep hole and use a watering can or bucket to fill it with water.

b. Fill the hole with water to moisten the soil and allow it to drain completely (NOTE: if the hole fills with water on its own or if water is still in the hole after 24 hours, choose a new location).

c. Fill the hole with water a second time and place a ruler or yard stick in the hole. Note the water level and time. After 15 minutes, check the water level again and note the new water level. Multiply the change in water level by 4 to get the number of inches of infiltration in an hour.

Soil Ribbon Test

Estimate your soil type by performing a ribbon test using the following steps:

a. Grab a handful of moist soil and roll it into a ball in your hand.

b. Place the ball of soils between your thumb and the side of your forefinger and gently push the soil forward with your thumb, squeezing it upwards to form a ribbon about 1/4 inch thick.

c. Try to keep the ribbon uniform in thickness and width. Repeat the motion to lengthen the ribbon until it breaks under its own weight. Measure the ribbon with a ruler or measuring tape and compare it to the following table.

Example soil ribbon test.
photo: North Dakota State University

Soil Type	Ribbon Length (inches)	Min. absorption rate (inches/hour)
sand	soil does not form a ribbon at all	8 in/hr
silt	a weak ribbon <1.5 inches is formed before breaking	1 in/hr
clay	a ribbon >1.5 inches is formed	0.04 in/hr

Estimate Your Stormwater Footprint

By completing the steps to create your project plan and filling out the Project Planning Worksheet, you can take your project one step further to use the NH Residential Loading Model to estimate your stormwater footprint.

The NH Residential Loading Model was developed by the NH Department of Environmental Services specifically for property owners to use to estimate the loading of sediment and nutrients, specifically phosphorus and nitrogen, running off of your property. This model can be used to:

- Calculate a property's "stormwater footprint", which is how much sediment, phosphorus or nitrogen runs off of a property
- Calculate the water quality benefit of installing stormwater treatment practices on your property.
- Compare the existing and planned future conditions of your property with different stormwater treatment scenarios. For example, to estimate the impact that building a garage or the impact that constructing a rain garden on your property would have on nutrient loading.
- Determine if your property meets a targeted nutrient goal or nutrient reduction for your watershed, if a target goal or reduction has been set.

The NH Residential Loading Model is available at www.des.nh.gov/organization/divisions/water/stormwater.

Follow the instructions for using the NH Residential Loading Model and you'll be on your way to better understanding and managing stormwater on your property to protect water quality.

Do-It-Yourself Fact Sheets

The fact sheets contained in this section give you everything you need to build these stormwater management practices at home.

Dripline Infiltration Trench - Page 29

Dripline infiltration trenches collect stormwater from your roof and store it until it soaks into the ground. They help control stormwater from running off your property.

Driveway Infiltration Trench - Page 31

Driveway infiltration trenches collect stormwater from your driveway and store it until it soaks into the ground. They help control stormwater from running off your property.

Dry Well - Page 33

Dry wells collect and infiltrate roof runoff at gutter downspouts, roof valleys, and other places where large amounts of water flow off of a roof. They help to reduce erosion and can reduce ponding and sitting water.

Infiltration Steps - Page 35

Infiltration steps slow down and infiltrate runoff on moderate slopes of 45° or less to help reduce erosion and define walking paths.

Pervious Walkways & Patios - Page 39

Pervious pavers have stone reservoirs under them that collect and infiltrate the rain and snow that accumulate on them. They help to reduce the stormwater runoff from your property.

Rain Barrel - Page 43

Rain barrels capture rainwater from your roof and store it for later use to water lawns, gardens, and indoor plants. They help to reduce the stormwater runoff from your property and also conserve water.

Rain Garden - Page 45

Rain gardens are bowl-shaped gardens that use soil, mulch, and plants to capture, absorb, and treat stormwater. They help to reduce stormwater runoff from your property and recharge groundwater.

Vegetated Swale - Page 49

A vegetated swale is a shallow channel that slows stormwater runoff and directs it to an area where it can infiltrate. Swales are typically used next to roads, sidewalks, and driveways. The plants in the swale help remove pollutants from stormwater and trap sediment, and the root system helps prevent erosion.

Water Bar - Page 51

A water bar intercepts water traveling down walkways, paths, gravel driveways, and other areas to divert water into stable vegetated areas. They helps prevent erosion.

Maintenance of LID Practices

As with any stormwater system, regular maintenance is essential to maximize performance and water quality benefits of LID practices. The general maintenance steps described below should be followed to properly maintain the treatment practices described in this guide.

INSPECT: Periodically and after rain events, inspect the practice for any obvious signs of stress or potential failure. Remove accumulated debris and sediment as needed. Check for ponding or poorly draining water - this can be a sign of clogging.

PLANTS: For practices with vegetation, new plants need to be watered frequently until their roots are established. Frequent weeding may be necessary in the first few years before plants become established. Check vegetation for signs of stress, disease and die-off and replace plants as necessary.

MULCH: For practices with vegetation, initially, 2" - 3" of mulch should be used to maintain soil moisture. Check periodically and after rain events and replenish mulch if needed. Once the vegetation in the treatment practices is established (2-3 years), mulch is not necessary, unless it is preferred for appearance.

OTHER MATERIALS: For practices with stone and other materials, periodically remove accumulated sediment, debris, and weeds from the surface. Practices lined with geo-textile fabric can clog over time. Check for ponding or slowly draining water. This can be a sign of clogging. If clogged, remove and wash the stone to clean out the accumulated sediment and debris.